

THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 19

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ECKHARD WOLFGANG
and REINHOLD KUHNERT

Appeal No. 95-0543
Application 08/008,734¹

HEARD: July 14, 1997

Before JERRY SMITH, LEE and CARMICHAEL, Administrative Patent Judges.

JERRY SMITH, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on the appeal under 35 U.S.C. § 134 from the examiner's rejection of claims 1, 3, 8-10, 16 and 17.

¹ Application for patent filed January 25, 1993.

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Claims 2, 6, 7 and 11 have been cancelled. Claims 4, 5 and 12-15 have been allowed by the examiner.

The claimed invention pertains to a structure for eliminating heat from a semiconductor chip in a semiconductor module.

Representative claim 1 is reproduced as follows:

1. A semiconductor module, comprising:
 - a semiconductor chip;
 - means affixed to said semiconductor chip for eliminating heat from said semiconductor chip;
 - an electrically insulating and thermally conducting layer of crystalline carbon between said semiconductor chip and said means for eliminating heat;
 - at least one intermediate layer between said semiconductor chip and said means for eliminating heat; and
 - connecting layers of silver between said semiconductor chip and said means for eliminating heat, wherein only one of said connecting layers is between said means for eliminating heat and said electrically insulating and thermally conducting layer.

The examiner relies on the following reference:

Potter	3,872,496	Mar. 18, 1975
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Claims 1 and 8 stand rejected under 35 U.S.C. § 102(b) as being anticipated by the disclosure of Potter. Claim 3 stands rejected alternatively under 35 U.S.C. § 102(b) or § 103 as being anticipated by or unpatentable over Potter. Claims 9, 10, 16 and

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17 stand rejected under 35 U.S.C. § 103 as being unpatentable over the teachings of Potter.

Rather than repeat the arguments of appellants or the examiner, we make reference to the brief and the answer for the respective details thereof.

OPINION

We have carefully considered the subject matter on appeal, the rejections advanced by the examiner and the evidence of anticipation and obviousness relied upon by the examiner as support for the rejections. We have, likewise, reviewed and taken into consideration, in reaching our decision, the appellants' arguments set forth in the brief along with the examiner's rationale in support of the rejections and arguments in rebuttal set forth in the examiner's answer.

It is our view, after consideration of the record before us, that the disclosure of Potter fully meets the invention as recited in claims 1 and 3. We reach the opposite conclusion with respect to claim 8. We are also of the view that the teachings of Potter and the level of skill in the particular art would have suggested to one of ordinary skill in the art the obviousness of the invention as set forth in claims 9 and 10. We reach the

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opposite conclusion with respect to claims 16 and 17.

Accordingly, we affirm-in-part.

We consider first the rejection of claim 1 under 35 U.S.C. § 102(b) as being anticipated by the disclosure of Potter. Anticipation is established only when a single prior art reference discloses, expressly or under the principles of inherency, each and every element of a claimed invention as well as disclosing structure which is capable of performing the recited functional limitations. RCA Corp. v. Applied Digital Data Systems, Inc., 730 F.2d 1440, 1444, 221 USPQ 385, 388 (Fed. Cir.); cert. dismissed, 468 U.S. 1228 (1984); W.L. Gore and Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 1554, 220 USPQ 303, 313 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984).

The examiner has supported this rejection by reading claim 1 on the Potter disclosure [answer, pages 3-4]. Appellants argue that Potter teaches that there are four layers between the heat sink and the diamond layer. According to appellants, this teaching of Potter cannot meet the claim 1 recitation of "wherein only one of said connecting layers is between said means for eliminating heat and said electrically insulating and thermally

conducting layer" [brief, page 6]. The examiner has responded that appellants are not giving claim 1 the appropriate scope based on the recitations of claim 1.

It would be appropriate to first review the teachings of Potter as applied by the examiner. Potter teaches a crystalline carbon (4) connected between a chip (diode 11) and a means for eliminating heat from the chip (copper base 1). There are four metal layers between the carbon and the chip and between the carbon and the base which serve to bond the three components together. Each of the bonds is made up of a chromium-gold-gold-chromium arrangement. Potter discloses that the gold-gold bond could also be a silver-silver bond or a bond of silver-gold [column 3, lines 43-45]. The examiner has taken the position that the bond between the crystalline carbon and the copper base could be a chromium-gold-silver-chromium bond within the teachings of Potter. Likewise, the bond between the crystalline carbon and the chip could have one or two silver layers.

When the Potter structure is viewed in this manner, there is one silver layer between the copper base and the carbon (layer 16 or 2) and one or more silver layers between the carbon and the

chip (layer 7 and/or 8). In this arrangement there are two or three silver layers, and only one of these layers is between the carbon and the copper base. Claim 1 only refers to the connecting layers of silver so that the presence or absence of other

layers is not relevant to the claimed invention. The "connecting layers of silver" would be met by the two or three silver layers of Potter noted above, and the "only one of said connecting layers" [of silver] would be met by the single silver layer 2 or 16.

Thus, when claim 1 is given its literal interpretation as required by law, it is seen that the claim does in fact read on the Potter device when appropriate ones of the gold layers are replaced by silver layers as suggested within Potter. It is emphasized that for purposes of reading the claim on Potter, the chromium and gold layers of Potter are ignored. Only the silver layers are looked at to meet the recitations of claim 1. We agree with the examiner that Potter does disclose at least one relationship of silver layers which would fully meet the

invention as recited in claim 1. Therefore, we sustain the rejection of claim 1 as anticipated by the disclosure of Potter.

Claims 9 and 10 depend from claim 1 and recite that the insulating and conducting layer of claim 1 is polycrystalline carbon and monocrystalline carbon, respectively. The examiner has rejected these claims under 35 U.S.C. § 103 as unpatentable over the teachings of Potter. According to the examiner, the diamond disclosed in Potter is either monocrystalline or

polycrystalline carbon. The examiner provides a reasoned analysis as to why the artisan would have found it obvious to use either form of crystalline carbon [answer, pages 5-6].

Appellants argue that the type IIa diamond of Potter is believed to be a monocrystalline carbon, and there is no suggestion in Potter to use a polycrystalline carbon [brief, page 8].

Although we would have preferred that the examiner cite a reference in support of the position that a polycrystalline carbon would have been obvious to the artisan in view of Potter, we nevertheless find that the record supports the examiner's finding of this fact. Every crystalline carbon is presumably either monocrystalline or polycrystalline carbon. The scope of claim 9 includes any polycrystalline carbon. Given that a

crystalline carbon is either monocrystalline or polycrystalline, the examiner's position that it would have been obvious to the artisan in 1992 to select at least one polycrystalline carbon as a substitute for the carbon of Potter is persuasive. We note that appellants have offered no rebuttal arguments as to the alleged errors in the examiner's analysis. Appellants only argue that the carbon in Potter is not polycrystalline. This argument, however, does not rebut the examiner's persuasive reasoning as to why polycrystalline carbon would have been suggested to the

artisan in 1992. Therefore, on the record before us, we agree with the examiner that the invention of claims 9 and 10 would have been obvious to the artisan in view of the teachings of Potter and the state of knowledge in the art at the time this application was filed. The rejection of claims 9 and 10 is sustained.

We now consider the rejection of claim 3 under 35 U.S.C. § 102(b)/103 alternatively as being anticipated by the disclosure of Potter or as being unpatentable over the teachings of Potter. The examiner notes that Potter shows the features of claim 3 in the same manner as noted for claim 1 except that Potter fails to explicitly show the claimed "sinterable connections" [answer,

page 5]. The examiner takes the position that the term "sinterable" or "pressure-sintered connection" adds no additional structure to the claimed device. Appellants argue that the claimed pressure sintered connection of claim 3 is structurally different than other connections and is not taught by Potter [brief, page 7]. The examiner responds that appellants have offered no evidence in support of this contention [answer, pages 9-10].

Claim 3 broadly recites that there is a pressure sintered connection between each of the layers. No unusual significance is attached to this phrase. Appellants state that "[t]he mechanical connection between the semiconductor chip CHIP2 and the heat elimination means W2 is subsequently effected through the use of a method of low-temperature joining technology referred to as pressure sintering, that is already known" [specification, page 5]. Thus, conventional pressure sintering is implied. To sinter something is defined as "to cause [it] to become a coherent mass by heating without melting" [see for example, Webster's Ninth New Collegiate Dictionary, 1985]. When the term "pressure sintered connection" is given this common and

ordinary interpretation, it is clear that Potter fully meets the literal recitations of claim 3.

There is no question that the components of Potter are bonded to each other by way of a chromium-gold(silver)-gold(silver)-chromium bond as discussed above. Potter describes a process of applying pressure and heat to effect a thermal compression bond. More specifically, Potter discloses that "thermal compression bonding is taken to mean a process for fabricating a robust permanent bond between two metal surfaces, simultaneously using heat and pressure without melting either metal surface" [column 3, lines 35-39, emphasis added]. The application of pressure and heat to bond two metal surfaces

together without melting either metal surface as described by Potter would appear to be the very definition of a "pressure sintered connection." Therefore, in our view, Potter clearly discloses such a connection.

With respect to appellants' argument that their pressure sintered connection is different from Potter's connection, we agree with the examiner that there is no evidence in support of this contention. We note that claim 3 recites no ranges of pressure or temperature by which any unusual properties can be

defined. At the scope defined by the recitation of claim 3, any pressure sintered connection of Potter would meet the language of the claim. We also agree with the examiner that even if appellants had set forth specific values of pressure and temperature in the claim, the burden would still be on appellants to demonstrate that such values of pressure and temperature do, in fact, result in a connection which is structurally different from the connection of Potter. The claim is directed to an article of manufacture, and the method by which the article is made cannot, per se, be used to assert novelty of the article.

Thus, the invention of claim 3 is fully met by the disclosure of Potter. Since Potter anticipates the invention of

claim 3, it must necessarily also render the invention of claim 3 obvious. Therefore, we sustain the rejection of claim 3 under 35 U.S.C. § 102(b) or under § 103.

We now consider the rejection of claim 8 under 35 U.S.C. § 102(b) as being anticipated by the disclosure of Potter. The examiner notes that the diamond layer of Potter is mounted directly on the copper heat sink through a possible intervening layer as in appellants' first and second embodiments, or that the

layers 3, 2, 16, 17 and 1 of Potter are considered to be a structural equivalent to the claimed means for eliminating heat [answer, page 4]. Appellants argue that Potter does not anticipate the claimed invention because there are four layers between the Potter heat sink and the Potter diamond [brief, page 6]. The examiner responds that when the means for eliminating heat is considered to include all of elements 3, 2, 16, 17 and 1 of Potter, then the carbon layer 4 of Potter is directly connected to layer 3 which meets the claim recitation [answer, pages 8-9].

We observe first that the examiner's initial theory of anticipation cannot be sustained. The direct mounting of claim 8 does not permit an intervening layer as suggested by the examiner. The first and second embodiments of appellants' invention (figures 2 and 3) show intervening layers, but are not described

as being directly mounted. Appellants do not suggest that mounting is direct until Figure 4 is described. Appellants note that "[t]he embodiment shown in Figure 4 differs from the embodiment shown in Figure 3 only in that the insulator layer ISO4 is grown directly on the cooling member W4 and no connecting

layer is provided between the insulating layer ISO4 and the heat elimination means W4" [specification, page 7]. Appellants proceed to describe the advantages of a direct connection and the elimination of the connecting layers. Therefore, we interpret the phrase "mounted directly" to require a connection such as shown in appellants' Figure 4 and which permits no intervening layers.

The examiner's second theory of anticipation requires that layers 3, 2, 16, 17 and 1 of Potter all be considered as part of the heat elimination means so that this combination is directly connected to the carbon layer. The examiner indicates that the five layers of Potter are structurally equivalent to the heat sink W4 of the invention within the meaning of the last paragraph of 35 U.S.C. § 112. We do not agree.

As we noted above, appellants disclose that the very difference between a direct connection as shown in their Figure 4 and the connections of Figures 2 and 3 is that there are no intervening layers in the direct connection of Figure 4. Appellants disclose how this direct connection provides better heat transmission resistance characteristics than any of the embodiments which use intervening layers. In order to find

structural equivalence, the examiner has ignored the specific disclosure of being "mounted directly," and has done precisely the opposite thing from that disclosed. That is, we do not see how the presence of layers 3, 2, 16 and 17 can be said to be structurally equivalent to a connection which forbids the presence of these intervening layers. In other words, the presence of certain structure is not structurally equivalent to the required absence of that structure.

Since we find the examiner's interpretation of claim 8 under 35 U.S.C. § 112 to be unsupported by the record in this case, we conclude that claim 8 is not anticipated by the disclosure of Potter in the manner indicated by the examiner. Therefore, we do not sustain the rejection of claim 8.

Claims 16 and 17 depend from claim 8 and recite that the insulating and conducting layer of claim 8 is polycrystalline carbon and monocrystalline carbon, respectively. The examiner has rejected these claims under 35 U.S.C. § 103 as unpatentable over the teachings of Potter for reasons discussed above. Even though these claims depend from claim 8 and the rejection of claim 8 as anticipated by Potter has not been sustained, we must

still consider whether the invention of claims 16 and 17 would have been obvious within the meaning of 35 U.S.C. § 103.

The examiner's prima facie case of obviousness depends upon his interpretation that layers 3, 2, 16, 17 and 1 of Potter can be considered equivalent to the heat eliminator W4 of appellants' invention. As we noted above, we cannot agree with this interpretation of claim 8. Absent this structural equivalence as asserted by the examiner, there is no evidence on the record in this case as to why it would have been obvious to eliminate the intervening layers of Potter and to mount the carbon component directly onto the heat sink 1. Thus, there is a difference between claim 8 and the teachings of Potter which has not been addressed by the examiner. The failure to address this difference between claim 8 and Potter results in a failure to establish a prima facie case of obviousness. Therefore, we do not sustain the rejection of claims 16 and 17 under 35 U.S.C. § 103.

In summary, we have sustained the rejection of claims 1, 3, 9 and 10, but we have not sustained the rejection of claims 8, 16 and 17. Accordingly, the decision of the examiner rejecting claims 1, 3, 8-10, 16 and 17 is affirmed-in-part.

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No time period for taking any subsequent action in
connection with this appeal may be extended under 37 CFR
§ 1.136(a).

AFFIRMED-IN-PART

JERRY SMITH)	
Administrative Patent Judge)	
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JAMESON LEE)	BOARD OF PATENT
Administrative Patent Judge)	APPEALS AND
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